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INSTITUTE OF GAS TECHNOLOGY
AFFILIATED WITH ILLINOIS INSTITUTE OF TECHNOLOGY
CHICAGO 16, ILLINOIS

GAS ABSTRACTS

VOLUME 5
NUMBER 9

SEPTEMBER
1949

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GAS ABSTRACTS is published and distributed monthly by the Institute of Gas Technology, Chicago 16, Illinois. The contents of selected papers and patents are reviewed impartially by the editorial staff and material of potential interest to the Gas Industry is presented. Subscription rates to non-members of the Institute: $15.00 per year. — Printed in the U.S.A.

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1. GAS INDUSTRY

British Gas Industry

Greenwood, H. D. TENDENCIES IN FUEL USAGE IN GREAT BRITAIN. *Coke & Gas* (British) 11, 251-255 (1949) *July*.

The author reviews the supply, distribution, and costs of fuel in Great Britain as of 1947. Fuel consumptions were as follows: coal, 192 million tons; coke, 14.22 million tons; gas, 446,086 million cu ft; and oil, 642 million gal (fuel and diesel). Increases in costs since 1938 are: coal, 70%; coke, 110%; oil, 80%; electricity, 10%; gas, 70% (London) to 35% (local).

O. P. Brysch

Building Projects

Tuttle, R. B. MORE THAN 150 ACTIVE REFINERY BUILDING PROJECTS NOW UNDER WAY. *Oil & Gas J.* 48, 208, 211-212, 215, 219, 223, 225 (1949) *July* 28.

Gas and petroleum industry building projects under consideration, building or completed during the first six months of 1949 are listed with their capacities and completion schedules. More than 80 natural-gas processing plants and plant extensions are building or planned, while some 75 were completed during the first half of the year.

J. C. Lane

Economics

Hess, F. O. WHAT PLACE AND WHAT PRICE FOR GAS IN OUR INDUSTRIAL ECONOMY. *Am. Gas J.* 171, 14-16 (1949) *July*.

The value of gas in an industrial process cannot be measured in cents per therm, since there are industrial applications of gas where quality of product, convenience, efficiency, economy of operation and compactness and cost of equipment would permit doubling the current gas price without changing the competitive position of this versatile fuel. Recently developed applications of radiant gas burners in the steel industry are cited as examples where the use of gas has improved technologies. Adequate supplies of gas for industry are essential, and domestic space heating demands should not be allowed to preempt all available natural gas supplies.

J. C. Lane

Falvey, J. F. GAS COMPANIES COMPLETE MORE THAN HALF OF 1949 FINANCING PROGRAM. *Am. Gas J.* 171, 12, 38 (1949) July.

The nation's gas companies have been meeting with marked success in raising the funds needed for their expansion programs. In instances where common stock has been offered, subscriptions have been very high, allaying fears held in some financial quarters that the raising of equity money by gas companies is not feasible. The natural gas industry which is expected to require $540 million of new capital during 1949 has already raised all but $200 million of this sum. Manufactured gas companies have raised about $55 million in the past six months, or more than two thirds of the new capital which they will require for expansion in 1949.

J. C. Lane

Light Hydrocarbon Production

LIGHT HYDROCARBON PRODUCTION UP 7 PER CENT FIRST 4 MONTHS. *Oil Gas J.* 48, 205 (1949) *July* 28.

The January-April production of natural- gasoline and cycling plants averaged 17,557,000 gallons per day, an increase of 7.0% as compared with production during the same months of 1948. The indicated demand during the January-April period was only 5.7% above that of the same period in 1948, resulting in an increase in stocks of 586,000 gallons per day. The rapid stock buildup decidedly affected the price of 26-70 natural gasoline, bringing it down from the 1948 level of 8.5¢/gal to 5.0¢/gal by March 1949. Two 0.25 cent increases since that time have raised the price to 5.5¢/gal currently. However, a 10 yr record for differential between the prices of natural and regular grade gasoline has been set during the first four months of this year.

J. C. Lane

Pipe Lines

Reed, P. 32,300 MILES OF PIPE LINE PLANNED; 3,350 MILES COMPLETED THIS YEAR. *Oil Gas J.* **48**, 226, 229, 231-232, 235 (1949) *July* 29.

Of the 32,300 miles of pipe line planned for future construction throughout the world, 23,300 miles are for projects in the United States. Domestic natural gas transmission lines account for 16,900 miles of the total. Lists are given of the major domestic and foreign pipe line projects recently completed, building or planned.

J. C. Lane

Safety

[SAFE PRACTICES IN THE GAS UTILITIES]. *Gas* **25**, *Safety Issue*, 42-94 (1949) *July*.

The frequency at which disabling injuries occur in the gas industry is 22.05 cases per million man hrs, a relatively high figure when compared with the figure 13.26 per million man hr for all industries. *Gas* has published this edition to reiterate the proper precautions to be taken and the method for safely performing the various jobs in this industry. One complete and detailed article is devoted to each of the following subjects: (1) Safety tips for gas manufacturing plants; (2) A model municipal ordinance; (3) Safe practice for street department crews; (4) Use of pressure control for shutting-off, replacing or bypassing lines. (Illustrations); (5) Recommended method for testing meter set assemblies; (6) Truck design and equipment; (7) Tool and safety equipment (including an identified display of tools for service men); (8) Working safely and protecting the body from injury; (9) Good driving habits and a detailed method for selection and training of drivers; and (10) Safety on the gas pipe line during its construction and during its operation.

E. F. Davis

Editor's Note: Copies of this safety issue of *Gas* are available from the publisher at $2.00.

Utility Sales

Ralph, H. D. UTILITY SALES OF NATURAL GAS UP 8.6 PER CENT OVER 1948. *Oil Gas J.* **48**, 207 (1949) *July* 28.

The natural gas industry is continuing to expand at a rapid rate as shown by the following increases during the first half of 1949 over the same period in 1948: utility sales of natural gas up 8.6%; customers, up 8.4%; revenues, up 10.5%. During the first six months of 1949, a record total of 1,620,000,000 Mcf of natural gas were sold by public utilities companies, not including the quantities sold in mixed gas or used for enriching manufactured gas. The continuously increasing demand for natural gas is attributed both to its convenience as a fuel and to its low price in comparison with other fuels. The wholesale-price index of the Bureau of Labor statistics, which is based on 1926 prices as 100, showed gas in April with an index of 92.8 and run-of-mine bituminous coal with an index of 192.1.

J. C. Lane

Water Conservation

THE WATER PROBLEM. *Chem. Eng.* **56**, 119-126 (1949) *July*.

The unprecedented consumption of ground water for irrigation, industrial and other uses has lowered the water table and created a serious shortage in many localities. This article reviews the various processes for conservation of water and utilization of surface and reclaimed waters. Large consumers are advised to utilize U.S. Geological Survey data to insure a continuous supply of suitable water.

W. E. Ball

2. APPLIANCES

Burners

Henke, F. PRINCIPLES OF COMBUSTION. PART I. *LP-Gas* **9**, 25-26, 47 (1949) *June.*

This elementary treatment of the principles of combustion was presented before the Rocky Mountain Empire LP-Gas Service School, February 7-9, 1949 at Denver. Basic concepts of combustion and the principle and operation of non-aerated and aerated burners are discussed.

A. J. Rudnitzki

Henke, F. PRINCIPLES OF COMBUSTION. PART II. *LP-Gas* **9**, 32, 66-68 (1949) *July.*

The second and final paper of this series describes the design of LP-gas burners to meet the performance standards of the modern domestic range. The generally accepted requirements for top-burner performance are best met by the two-section simmer burner.

A. J. Rudnitzki

3. COMBUSTION AND INDUSTRIAL FURNACES

Atmospheres

Darrah, W.A. THE FIELDS OF USE FOR PREPARED ATMOSPHERES. *Ind. Gas* **28**, 9-12, 20-24 (1949) *August.*

A complete synopsis of the applications of protective and reactive atmospheres to metal treating, paint and varnish storage, ceramic firing, food protection and fire protection is given.

E. F. Davis

Combustion

Turin, J. J. and Huebler, J. MEETING COMBUSTION PROBLEMS. *Am. Gas Assoc. Monthly* **31**, 15-17, 51-53 (1949) *July-August.*

Turbo-jet, ram-jet and rocket propulsion are reviewed to determine if these newer techniques contribute to the overall understanding of the problems of combustion encountered in industrial gas utilization. The fields of propulsion combustion and industrial combustion have the common problem of increasing the rate of flame propagation to effect increased rates of energy release. As an approach to the solution of this problem, the A.G.A. Committee on Industrial and Commercial Gas Research is sponsoring a study of the detonation process. Cf. *Gas Abstracts* **5**, 66 (1949) *April.*

A. J. Rudnitzki

Drying Ovens

Smith, A. Q. GAS-FIRED LITHO OVENS SPEED CAN PRODUCTION. *Ind. Heating* **16**, 1236-1238, 1240, 1242-1244 (1949) *July.*

Of the 3.5 million tons of steel used yearly to make cans nearly 75% is used as food containers. One major producer has recently constructed a new plant in which 14 gas fired coating and lithographic drying ovens are installed. The four coating ovens have a capacity of 7.5 therms per hr. while the finishing ovens use 6.5 therms per hr. The unique feature of this plant is that the printing and coating of the cans has been geared to the speed of the can forming machinery.

E. F. Davis

Flame Structure

Markstein, G. H. CELL STRUCTURE OF PROPANE FLAMES BURNING IN TUBES. *J. Chem. Phys.* **17**, 428-429 (1949) *April.*

Unusual flame structures, consisting of one or more approximately hemispherical cusps, have been observed in propane-air and propane-air-nitrogen mixtures burning under flowing conditions in glass tubes of 2 ¾ in. and 4 in. I/D. These cusps are convex toward the unburned gas and appear at the upper limit of inflammability of propane-air-nitrogen flames. At a lower propane/air ratio of about 0.06, for mixtures containing more than 28% added nitrogen, the cusps flatten out to form a single smooth disk of flame. A theory interpreting the phenomenon is being developed.

A. J. Rudnitzki

Power Generation

Gilg, F. X. THE POWER PLANT: RECENT DEVELOPMENTS IN STEAM GENERATION. *Blast Furnace Steel Plant* **37**, 836-841 (1949) *July.*

Recent developments in boiler practice include: (1) Increase in operating pressure from 450 psi in the 1920's to the present maximum of 2500 psi; (2) Increase in maximum operating temperature from 750°F to the present 1100°F limit; and (3) Methods for controlling superheat temperatures such as by (a) an attemperator tube bundle, (b) high pressure water sprays in the superheater, (c) recirculating flue gases back to the boiler and (d) adjusting the combustion zone to vary the quantity of heat absorbed in water-cooled furnace walls. Due to the previous temperature limitation of tube metals, considerable interest was shown in reheaters in increasing the efficiency of the boiler power plant. With the development of high temperature alloy materials, it became profitable to invest in a non-reheat cycle with higher primary steam temperatures. At present another temporary limitation in steam temperature in addition to the higher cost of fuels is causing new interest in a high temperature reheat steam power plant cycle. Other important developments include (a) the cyclone furnace which operates with coarse coal and is an efficient ash separator, and (b) pressure furnaces operating without induced draft fans, eliminating air infiltration and resulting in an approximate 1% increase in boiler efficiency.

C. Von Fredersdorff

WHERE THE GAS TURBINE FOR POWER GENERATION STANDS IN 1949—A PROGRESS REPORT. *Power Generation* **53**, 102, 104, 106 (1949) *July.*

The gas turbine for power generation has established itself in commercial form as evidenced by the present installation of: (1) a 4800 hp gas turbine Alco-GE locomotive; (2) a 3500 kw GE stationary gas turbine generator at Oklahoma Gas and Electric Co.; (3) a 2000 hp Westinghouse gas turbine drive for a compressor installation on the Mississippi River Fuel Corporation gas pipe line; and 4) three 2500 hp Elliott Company gas turbine plants for marine propulsion. This year's first gas turbine for power is the Alco-GE locomotive unit, generating 53 hp per ft of locomotive length as compared to the Diesel-electric 30 hp per ft. Diagrams and photographs are included.

C. Von Fredersdorff

4. CARBONIZATION AND GASIFICATION

Carbonization

Gaskill, M. S. A REVIEW OF MODERN CARBONIZING METHODS. *Gas Times* (British) **60**, 96, 97-98 (1949) *July* 15.

The author describes the period of greatest development in the carbonization industry as the decade 1904 to 1914, in which the vertical retort systems were introduced and the use of gas for cooking, industrial heating, and mantle lighting was expanded. Calorific value replaced candle power standards, and the chamber ovens, low temperature carbonization, and mechanical producers also were developed at this time. Since then development has settled down to research on practical applications in details rather than in basic principles. Thus the modern gas engineer has had a choice between several carbonizing systems each having particular advantages. His choice has determined the structure of the industry today and has been influenced by the factors of cost of gas production, plant area available, locale of works, labor conditions, and type of fuel available. A quoted comparison of costs of gas making in coke ovens, vertical, and horizontal retorts favors the second method. All three methods will be retained for a considerable period in the future, but desirable developments would seem to point to complete gasification, and to use of a very wide range of coals.

O. P. Brysch

Carbonized Coal Structure

Franklin, R. E. A STUDY OF THE FINE STRUCTURE OF CARBONACEOUS SOLIDS BY MEASUREMENTS OF TRUE AND APPARENT DENSITIES. PART II. CARBONIZED COALS. *Trans. Faraday Soc.* (British) 45, 668-682 (1949) *July.*

Structural changes occur in carbonized coals between 600° and 1000°C which are indicated by the differences in the measured true and apparent densities. Carbonized coals contain a large volume of very fine pores (in addition to the unrelated bubble-structure developed by coking coals), and a large internal surface area, even after heating to above 1000°C. The fine-pore *porosity increases with increasing carbonization temperature up to 1000°C.* The *loss of reactivity* and the *apparent decrease in porosity* and internal surface on heating up to 1600°C *arise from diminished accessibility* of the pores. The accessibility to liquids and gases is governed by *constrictions in the pore system* of a width of the same order as the diameters of the molecules used for density measurements (2 to 6 Angstroms) thus the solids act as molecular sieves. As the carbonizing temperature is increased above 600°C, the fluids methanol, CS_2 and water are successively excluded in order of diminishing size of molecule, *until after 1000°C helium* also is practically excluded. Similar results were obtained with adsorption of hydrogen, methane and oxygen. By grinding from 72-mesh British Standard to 240-mesh British Standard, the densities, in helium, of coals carbonized above 1000°C were considerably increased, indicating that more internal pore volume had been exposed. The fine-pore structure of a carbonized coal is directly related to that of the raw coal.

O. P. Brysch

Coal Extraction

Dryden, I. G. C. THE BEHAVIOR OF BITUMINOUS COALS TOWARDS SOLVENTS. *Bull. Brit. Coal Utilization Research Assoc.* 13, 113-138 (1949) *April-May.*

This is a condensed review of the most important older literature and of recent literature up to 1947 with 138 references upon behavior of bituminous coals toward solvents. The pyridine class of solvents is emphasized, although the benzene class with lower solvent power, and the aniline class with intermediate solvent power are treated. Dipole moment and dielectric constant of solvent seem to influence extractive power. Solvent action is not greatly influenced by coal particle size, is decreased by oxidation, and increased by partial hydrogenation of the coal substance. Coals which have been preheated adsorb pyridine with increasing temperature, up to a maximum which is characteristic of the coal; the yield of extract likewise has a maximum, large in the case of coking coals. Physical changes, such as peptization of the extraction residue occur at temperatures of extraction above 250°C, and the extracts contain more molecular and less micellar material than low temperature extracts. Yield of extract has a maximum between 80% and 87% carbon and decreases as rank of coal increases, becoming negligible at 92-93% carbon. Vitrain yields most extract, fusain least. The extract swells and agglomerates on heating, the residue will not. Commercial adaptations are mainly the production of low-ash carbon for electrodes. Low temperature extracts offer advantages as raw material for chemicals of controlled complexity produced by mild chemical degradation.

O. P. Brysch

Coal Petrography

Stach, E. THE PETROGRAPHY OF COAL. *Bull. Brit. Coal Utilization Research Assoc.* 13, 193-198 (1949) *June.*

This article is translated from the F.I.A.T. Review of German Science (1939-1946) Geology and Paleontology. Petrographic studies of lignites by Jurasky have shown that volcanic heating has produced higher rank in the Sudeten hard lignites. Microscopic studies of the resins showed that the particulate dispersed resins normally in soft lignites have melted and seeped into the coal substance. The work of Siegl on Austrian lignites using oil-immersion microphotography shows evidence that static pressure has increased the rank, and that canneloid coals result from redeposition of water-born residues from peat. Wicher (1942) and Scho-

chardt (1943) have published monographs on methods and technique of lignite petrography which indicate a need for extended study. Petrographic studies of German bituminous coal by E. Stach in his 1940 book distinguish 3 kinds of dull coat. Olbrich's studies of cannels and bogheads have enabled predictions of tar yields from these coals. Notzold's work has related spontaneous ignition to the cleavages in the seams caused by tectonic movements. Stach also has found that finely divided pyrite first occurs as a gel which later form spherical aggregates of cubical crystals around which the coal layers are bent. Zinc, copper and lead sulfides occur with pyrite in the Piesberg anthracite. Machowsky has also published (1943) studies of minerals in coal. Falke's 1944 study of Saxon coal beds is not accepted as explaining the ranks of the coals, but marine influence on the beds is proposed as an important factor.

O. P. Brysch

Contact Coking

Schutte, A. H. NEW PROCESS FOR CONTINUOUS CONTACT COKING. *Petroleum Processing* 4, 769-775 (1949) *July.*

A description and operating data are presented for a process which makes coke from heavy oils continuously. The principles of operation are similar to those of the TCC process, except that coke is used as the circulating solid. The operating temperature is in the range of 900°F and coking time is from 15 to 40 minutes. The principal product obtained from a reduced crude is gas oil, amounting to about 70% of the charge. Complete designs and estimates have been made for units of 6500 to 10,000 bbls per day charging capacity.

W. J. Merwin

Dry Cooling of Coke

THE DRY COOLING OF COKE. *Gas World* (British) 130, 1257-1262 (1949) *July* 30; *ibid.* 1302-1309 (1949) *August* 6.

All dry cooling installations in the United Kingdom are described and operating experiences are given. The potential heat available for recovery by this process is totaled for gas works and coke ovens. Comparisons are shown for the net estimated costs of steam by dry cooling and independent boilers. A study of these figures reveals that dry cooling is not economical for small gas plants. On the other hand, dry cooling is attended by substantial economies at coke plants, particularly for new installations. Dry-cooled coke is harder than wet-quenched, as shown by comparative screen analyses, shatter and tumbler tests. The blast furnaces on which dry-cooled coke is used show a low rate of coke consumption. Dry cooling also permits the precise screening of breeze into graded sizes with a possible higher return for some of the larger sizes.

W. E. Ball

Effluents

INDUSTRIAL WASTE WATERS. *Coke & Gas* (British) 11, 240-244, 250 (1949) *July.*

The proper disposal of gas works effluents has always been a problem to the industry. This article deals mainly with ammonia liquors and effluents, and disposal into public sewage treatment systems. Because of high B.O.D. (biochemical oxygen demand) ammonia liquor should never be discharged to the sewer without distillation. Liquor should also be tar-free, cooled, and diluted at least 150-fold. Monohydric phenols are easily oxidized, but higher tar acids and thiocyanates are difficult to treat. The higher tar acids may be kept to a minimum by restricting contact between tar and liquor.

W. E. Ball

REPORT OF THE DIRECTOR FOR THE YEAR 1948. PART V. EFFLUENT PROBLEMS. Gas Research Board Communication GRB 45, 30 (1949) *April.*

Laboratory studies of the formation of thiocyanate, a constant offender in gas works effluents, has indicated that the concentration of oxygen in the gas passing through water scrubbers is the controlling factor. Oxygen must be kept well below 0.5% to achieve reduction in thiocyanate formation in the liquor to 0.28 g/l or lower. Thiocyanate formation is prevented by the use of the MoS_3 and Cu-Cr catalytic hydrolysis process for removal of organic S, as this also hydrolyzes the hydrogen cyanide in the gas to ammonia.

O. P. Brysch

Flash-Back Meter

Wearne, E. AUTOMATIC WARNING OF CHANGES IN GAS QUALITY. *Gas World* (British) 130, 1200-1202 (1949) *July* 16.

A system for warning gas plant operators of a change in gas quality which causes flash back in burners has been successfully employed by one gas company in England. Essentially a platinum thermocouple is installed in the inner cone of a bleed burner which is critical with respect to flash back, (in this case a burner used for street lighting). As the flame cone shortens (tendency to flash back) the thermocouple is further heated and conveys the emf to a millivoltmeter. The indicating stem of the millivoltmeter then interrupts the light path of a photoelectric cell and this impulse is amplified to operate a warning light or klaxon.

E. F. Davis

Gas Production

Ohlsson, O. A. PROCESS AND APPARATUS FOR THE OPERATION OF GAS PRODUCERS. U.S. 2,476,760 (1949) *July* 19.

A producer for gasifying lignites is proposed which comprises a distillation zone superimposed upon and continuous with a gasification zone. To avoid the expense of recovery of the lignite tar, the tar-bearing gases from the top of the distillation zone are forced downward by a fan to several combustion chambers spaced radially around the combustion zone level, where appropriate air dosage is given to ensure complete combustion of the tars. The CO_2-laden gases then pass through radial ports into the hot fuel bed of the producer where they are reduced to producer gas and pass out of the generator with the main stream of producer gas through radial outlet ports located just below the distillation zone.

O. P. Brysch

REPORT OF THE DIRECTOR FOR THE YEAR 1948. PART II. GAS PRODUCTION, PURIFICATION AND STORAGE. Gas Research Board Communication GRB-45, 5-22 (1949) *April.*

Research on gas production, purification and storage are reported for 1948. Gas production studies have continued along four main lines of experiment. The first consists of pilot-plant gasification of coal in hydrogen under pressure. Hydrogen is obtained from a generator in which solid residues from the hydrogenation stage are gasified with steam and oxygen. Non-caking coal in a static bed 8.3 ft deep at 50 atm pressure and 1175°C required 33,300 cu ft hydrogen per ton dry coal in order to produce 40,000 cu ft of 493 Btu gas containing 26.75% methane, with a solid residue of 1370 lb, in batch-type runs. Improved yields and better temperature control are expected in a full-scale plant with a continuously-descending charge, which can be superimposed upon the hydrogen generator. A second process of hydrogen-pressure treatment was under study on a fluidized bed, 4 in. in diameter by 10 in. deep. Here methane equilibrium is not approached. 220 therms of methane per ton of semi-coke could be produced at 25 atm pressure, although overheating caused a reduction in rate of methane production. With 18% methane added to control overheating, the overall yield of methane at 25 atm was reduced, but it still amounted to over 100 therms per ton. With 16% carbon monoxide in the hydrogenating gas at 40 atm, methane yields were 180 therms as against 300 for hydrogen alone. A third line of research on catalytic synthesis of methane as a means of gas enrichment has been abandoned except for a final experiment on life of catalyst, since enough data for full-scale plant design have been obtained. Finally, a small water gas set (12.5 Mcf/hr) is under construction for determination of effects of blast-preheat. As an improvement to the Cu-Cr and MoS_3 catalysts for organic S removal, hydrolysis of organic S in crude detarred wet gas over these catalysts showed 1000 hr life at 750 space-velocity per hr. Gas of 42 grains organic S was reduced to 9.7 grains in presence of 700 grains H_2S. Methods of catalyst regeneration are under study. Field research on hardening of oxide in boxes shows that "tar" formed there by polymerization of unsaturates in the gas before the oil scrubbers is an important factor. Dense packing, high proportions of dust in the oxide, and salt crystallization due to drying out also contribute to hardening. Research on wind pressure is under way on a 1 MMcf holder to confirm design fac-

tors. A practical scale study of corrosion cracking of welded mains also is projected on a bypass plant main composed of test-sections of varying compositions.

O. P. Brysch

Purification

Arnold, M.H.M. and Baxter, D. (assigned to Imperial Chemical Industries Ltd.) SEPARATION OF ETHYLENE FROM GASEOUS MIXTURES. U.S. 2,476,472 (1949) *July* 19.

This patent deals primarily with a continuous process for separation of ethylene from coke oven gas by a fluidized adsorption method. Active carbon, particle size 180 to 250 mu, has been found to be satisfactory as an adsorbent. Coke oven gas is passed through the carbon at the rate of 3 cm per sec, creating a slightly fluidized bed. The rich adsorbent is then transferred to another vessel and desorbed with superheated steam in a boiling fluidized bed. Cooling of the vapors produces a gas of 42% ethylene content. The adsorbent is then cooled by inert gas and recycled.

W. E. Ball

Guillaumeron, P. LIQUEFACTION FOR SEPARATING HYDROGEN FROM COKE-OVEN GAS. *Chem. Eng.* **56**, 105-110 (1949) *July.*

The installed capacity for this process has reached 2,500 tons per day in Europe, units having been constructed to handle over 7,000 cfm. In addition to ordinary purification, pretreatment is necessary to prevent freezing in the apparatus. Ammonia is used to remove CO_2 and nitrous oxides, final traces being removed with caustic soda. The gas, at a pressure of 10 to 20 atm, enters a series of heat exchangers, then a vaporizer, and is expanded through an expansion engine with performance of external work, lowering the temperature to –200°C. Because of the negative Joule-Thomson coefficient for hydrogen, the Linde cycle is not applicable. An optional plan is to cool the gas with circulating nitrogen. By means of nitrogen scrubbing, hydrogen of 99% purity may be obtained. Methane, ethylene, and other products may also be isolated.

W. E. Ball

Meek, L.R. and Bureau, A.C. TOWER BOX PURIFIERS. *Gas Times* (British) **60**, 159-161 (1949) *July* 29.

A Balfour system of tower boxes has been designed to increase the advantages in tower construction as opposed to the use of shallow or deep oxide boxes of conventional design. A typical layout for this type of tower installation illustrates how the ground space required is held to a minimum and how oxide handling is completely mechanized. Normally downward gas flow is employed through series of stacked trays, each containing a layer of purifying material, but upward flow or provision for flow reversal can be arranged. It is claimed that mechanized oxide handling reduces labor requirements and eliminates much of the unpleasant work associated with emptying and recharging oxide purifiers.

H. Hakewill

Reactor Design

Hall, R.E. and Smith, J. M. DESIGN OF GAS-SOLID CATALYTIC REACTORS. *Chem. Eng. Progress* **45**, 459-470 (1949) *July.*

An experimental program is described for the investigation of gas-solid catalytic converters. Reaction rate and thermal conductivity data were obtained using a differential reactor. Conversion and temperature distribution were measured in an integral converter. Although gas flow was turbulent, the radial temperature distributions in both solid and gas phases were parabolic, indicating little radial mixing. Calculation of temperature distribution and conversion by Grossman's method and the computation of activation energies from Arrhenius' equation are described.

S. Katz

Statistical Methods

Jowett, G. H. and Sarjant, R. J. STATISTICAL METHODS IN FUEL TECHNOLOGY. *J. Inst. Fuel* (British) **22**, 238-250 (1949) *June.*

Following a brief introduction to the fundamental ideas of statistics, the technique of regression is outlined and discussed in relation

to some typical problems in fuel technology. The simplest applications of the analysis of variance receive similar treatment. In illustration, several technological problems are solved; these include a study of factors affecting fuel consumption in a reheating furnace, and of the relationship between calorific value, volatile matter, carbon, and hydrogen in samples of coal.

Authors' abstract

Tar

Hyman, D. and Kay, W. B. HEAT CAPACITY AND CONTENT OF TARS AND PITCHES. *Ind. Eng. Chem.* **41**, 1764-1768 (1949) *August.*

Heat capacity of water gas and coke oven tars and pitches were determined and correlated with temperature and the specific gravity or benzene-soluble fraction of the material. Average deviations of approximately 4% were obtained in the 100 to 600°F temperature range. Corresponding heat-content equations are also presented.

H. R. Linden

Reeve, C. G. THE APPLICATION OF INSULATOR HEATING TO ELECTROSTATIC TAR PRECIPITATORS. *Gas World* (British) **130**, 1140-1142 (1949) *July* 2.

Condensed water on insulation of electrostatic tar precipitators may bridge the insulation, causing a short circuit of sufficient force to smash the insulator. Current practice is to prevent condensation by heating the insulator with a horse-shoe shaped steam coil, maintaining a chamber and insulator temperature of about 150°C. Substitution of an electric immersion heater for the steam coil caused the deposition of sulfur compounds, attributed to the high element temperature, of the order of 500°C. The addition of dispersing plates resulted in no improvement. A new element, having the same characteristics as the steam coil, has been constructed.

W. E. Ball

The following article, which has not been abstracted, is called to your attention:

Curran, M.D. EQUIPMENT AND PROCESSES FOR REDUCING PETROLEUM RESIDUES TO HIGH QUALITY SOLID COKE. *Oil Gas J.* **48**, 100-102 (1949) *August* 18.

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Chemical Plant

Barnes, K.B. FROM NATURAL GAS, STEAM, AIR, SPENCER CHEMICAL COMPANY MANUFACTURERS AMMONIA, AMMONIA NITRATE, METHYL ALCOHOL, AND DRY ICE. *Oil Gas J.* **48**, 40-44, 64 (1949) *August* 4.

The Spencer Chemical Company's Jayhawk plant located near Pittsburg, Kansas is described. It uses between 16 and 37 MMcf per day of natural gas to produce ammonia, ammonium nitrate, methyl alcohol and dry ice.

C. H. Riesz

Corrosion

Hackerman, N. and Schmidt, H.R. KINETICS OF THE CORROSION PROCESS IN CONDENSATE GAS WELLS. *Ind. Eng. Chem.* **41**, 1712-1716 (1949) *August.*

The corrosion products formed in SAE 1020 steel exposed in gas-condensate wells for relatively long periods of time were examined microscopically and analyzed by X-ray and diffraction methods. Rate equations for the linear portions of the rate of corrosion curves were obtained. The results substantiate a previously devised classification of wells as corrosive, mildly corrosive, and non-corrosive. (Hackerman, N., and Shock, D. A., *Ind. Eng. Chem.* **39**, 863 (1947).

B. E. Hunt

Shock, D.A. CONDENSATE-WELL CORROSION CONTROL. *Oil Gas J.* **48**, 77-80 (1949) *August* 11.

A laboratory apparatus is described which was used to measure the pH of carbonic acid solutions at partial pressures of CO_2 up to 1 atm. The pH values were obtained in solutions of acetic acid, sodium chloride, sodium acetate and the neutralizing agents, sodium carbonate, ammonium hydroxide, and magnesium hydro-

xide. Results indicate that the pH could be raised to 5.5 and higher by the addition of neutralizing agents even in the presence of excess CO_2. The addition of magnesium metal will reduce the attack on steel coupons.

B. E. Hunt

Dehydration

Rollman, W.F. (ssigned to Standard Oil Development Co.) METHOD OF DRYING GASES. U.S. 2,475,255 (1949) *July* 5.

This appears to be an application of light or dense phase fluidization in which fluidized cold granular particles chill a gas such as air or natural gas sufficiently to cause fine ice particles to form. The problem is to remove the ice particles which are supposed to be entrained in the gas.

J. D. Parent

Interchangeability

Mong, P.E. INTERCHANGE OF PROPANE-AIR WITH NATURAL GAS. *Gas Age* **104**, 35-36 (1949) *July* 21.

The American Gas Association I_F, I_V, and I_L index for interchange of propane-air with natural gas at heating values from 800 to 2200 Btu are given. A chart is given to determine the percentage of adjustment gas required for satisfactory interchange.

E. F. Davis

LP-Gas

Clifford, E. A. A PRACTICAL GUIDE TO LP-GAS UTILIZATION. I. AN INTRODUCTION TO LP-GAS. *LP-Gas* **9**, 33-40 (1949) *April.*

This first of a series of articles is intended to introduce students to LP-gas by giving a brief history, indicating the uses for LP-gases, and explaining the various characteristics of the gas such as boiling point, vapor pressure, limits of inflammability, specific gravity, and heating value. At the end of this article there are questions on the subject matter covered which can be very useful in training men for the LP-gas industry.

E. F. Davis

Clifford, E. A. A PRACTICAL GUIDE TO LP-GAS UTILIZATION. II. FUEL CONTAINERS. *LP-Gas* **9**, 66-70, 72, 74, 76 (1949) *May.*

In the second article of this series, the need for special containers for LP-gases and the specific requirements for storage above and below ground level are presented. The working of the safety relief valve, service line valve, vapor return valve, filler valve, liquid level indicator, excess flow valve, pressure gauge and regulator are explained. Questions on the subject matter covered are included.

E. F. Davis

Clifford, E. A. A PRACTICAL GUIDE TO LP-GAS UTILIZATION. III. INSTALLATION OF FUEL CONTAINERS. *LP- Gas* **9**, 35-38, 40, 42, 44, 46 (1949) *June.*

In this third article the author discusses the National Board of Fire Underwriters requirements for the installation of LP-gas storage tanks both above and underground. In addition he discusses the construction of foundations, tank handling equipment, removal of moisture from tanks, purging and leak testing of tanks, and the anchoring of underground tanks. Questions on the subject matter are included at the end of the article.

E. F. Davis

Clifford, E. A. A PRACTICAL GUIDE TO LP-GAS UTILIZATION. IV. GAUGING AND FILLING CONTAINERS. *LP-Gas* **9**, 37-38, 40, 42, 44, 48, 50 (1949) *July.*

Method for determining the gallons of LP-gas contained in storage tanks by reading a float gauge or a strapping stick and correcting for the temperature and gravity are illustrated in detail. Calculations are also used to illustrate the maximum level to which a cylinder can be safely filled.

E. F. Davis

Clifford, E. A. A PRACTICAL GUIDE TO LP-GAS UTILIZATION. V. PRESSURE REGULATORS. *LP-Gas* **9**, 34-35, 44, 46, 50, 52, 56 (1949) *August.*

This article is devoted to an explanation of pressure, pressure equivalents, methods for measur-

ing pressure and the operating principle of pressure regulators. All types of pressure regulators and their performance are discussed in detail.

E. F. Davis

Natural Gasoline

Cox, R.F. UNIQUE DESIGN ACHIEVES INCREASED PROPANE RECOVERY. *Oil Gas J.* 48, 113-114, 116, 118, 120 (1949) *August* 18.

Principle features are the use of lean oil chilling and the use of an absorption oil of low molecular weight. Gas at 2,700 psi is throttled to 1,400 psi just after metering at the well site. Gas pressure is further reduced by flashing just ahead of the absorbers and the flash gas is sent to bauxite dehydrators. Dewatered distillate and dried gas are combined and chilled to 60°F. After separation, gas passes to the absorbers which operate at 900 psi and 60°F and use oil of molecular weight 150 to 155. Rich oil is flashed in two stages, heated, sent to a vent tank for further reduction in gas content and finally treated in a dual still. Distillate from the first flash tank is flashed in stages and sent to a fractionator using agitation steam to remove gasoline. Bottoms are sent to a similar vessel for separation into naphtha, kerosene and gas oil. The products separation is accomplished with a deethanizer, depropanizer and debutanizer. 99% propane and 99% butane are produced. Natural gasoline and naphtha are blended for motor fuel. It is claimed that the reduced absorber temperature, which is accomplished by propane refrigeration, cuts the absorbed fixed gases by 25%. Also, it decreases difficulty with retrograde loss of lean oil and permits a decrease of 50% in the size of heat exchange and oil stripping equipment.

J. D. Parent

Odor Detection

Crocker, E.C. and Sjostrom, L.B. ODOR DETECTION AND THRESHOLDS. *Chem. Eng. News* 27, 1922-1925 (1949) *July* 4.

From the known facts about odor the authors reason that it is a molecular property of a substance which excites the sense of smell. At present odor can be detected only by sense organs. Of special interest to the gas industry is the ability possessed by dogs to discriminate between various odors, which has led to their successful use for finding leaks in buried pipelines carrying odorized natural gas. Several theories on the mechanism of odor perception are discussed but, in the opinion of the author, most of these are based on guess work. It is pointed out that present physical and chemical means for the detection and identification of relatively small numbers of molecules of substance dispersed in the air are still far less sensitive than the limits of nasal recognition. The technique of employing odor accumulators, such as water, glycerol, a bland oil, or absorptive carbon, is mentioned as one convenient way to collect sufficient sample to determine the types, distribution, and intensity of odorant when present in extremely low concentration. The determination of odor threshold limits and the numerous devices developed by various investigators in their efforts to gather odor threshold data are briefly described. In conclusion the authors indicate the limitations and contradictions encountered in published material on threshold odor values and list some of the more important applications of odor detection.

H. Hakewill

Pipe Lines

Reed, P. ROCK SHIELDS PROVE ECONOMICAL IN PROTECTING PIPE-LINE COATING. *Oil Gas J.* 48, 84, 86 (1949) *July* 21.

The use of a pliable, hard mastic board as a protection for pipe line coatings has proved to be more economical than padding in most installations studied. The uniformity of construction simplifies installation procedures and results in installation savings. Applications other than rock shielding which are proposed for this procedure are: wrapping coated pipe at river crossings; padding for river clamps and hold-down anchors at river crossings and for protecting coated sections being pulled through swamps or casings.

B. E. Hunt

Production

Calhoun, J.C., Jr. ENGINEERING FUNDAMENTALS: PHASE BEHAVIOR-RETROGRADE CONDENSATION. *Oil Gas J.* **48**, 341 (1949) *July* 28.

The phenomenon of retrograde condensation is described and an effort is made to offer an explanation based on kinetic theory.

J. D. Parent

Caruthers, C.B. PROCEDURES, BENEFITS, PROBLEMS OF UNITIZATION. *Oil Gas J.* **48**, 302-308 (1949) *July* 28.

Procedures, benefits and problems encountered in attempting to set up unitized operation are discussed in some detail. State laws relevant to compulsory unitization are reviewed.

J. D. Parent

Hinton, E.O. ROTARY COMPRESSORS FOR FIELD BOOSTER SERVICE. *Oil Gas J.* **48**, 71, 73, 96, 99 (1949) *July* 21.

Maintenance and operating difficulties with rotary compressors for field booster service are discussed. Three natural gas engine rotary compressors, each rated at 1,430,000 cu ft per day at 5 psig suction and 25 psig discharge pressure comprise the installation. Principal maintenance problems have been with the lubricant for the gas engine and with the engine jacket water control. A cost break down of the initial investment and the operating costs are included. It is concluded that rotary compressors provide an economical and satisfactory method for field booster service.

O. T. Bloomer

Jones, J.D. UTILIZING LINE PRESSURE TO OPERATE GATE VALVES. *World Oil* **129**, 195-196 (1949) *August*.

The author describes an ingenious application of hydraulic power already present in a pipe line, bypassing a small amount of fluid through a unit which mechanically "wheels" gates otherwise requiring extra personnel and expenditure of considerable muscular effort.

Editor's abstract

Kaveler, H.H. EVALUATING GAS FUNCTIONS IN OIL PRODUCTION. *World Oil* **129**, 158-160, 162, 182 (1949) *August*.

The author shows how the industry has found that the best practice is to maintain pressure by gas- injection from early in the life of a pool instead of permitting reservoirs to decline to a "secondary recovery" stage before the effort is made to make the maximum use of gas as an oil recovery agent. Repressuring operations have now given way to gas-injection pressure-maintenance wherein gas produced from a pool is returned to the reservoir from early in the life of production. Under such practice, pools do not reach the stage of depletion requiring repressuring. When the modern practice is followed, the result is a substantial increase in the recovery of oil over that which could otherwise be obtained. The paper, somewhat abridged here, was presented to the Regulatory Practices Committee, Interstate Oil Compact Commission, at the recent meeting in Wichita, Kansas.

Editor's abstract

Stevens, L.C. and Boots, B.P. PRODUCTION FROM CONDENSATE RESERVOIRS. *J. Inst. Petroleum* (British) **35**, 309-349 (1949) *May*.

This is a summary of the problems and practices in producing from a condensate reservoir. It is recommended as an excellent review.

J. D. Parent

Tinker, N.A., Jr. PLANNING, RUNNING, AND CEMENTING CASING STRINGS. *Petroleum Engr.* **21B**, 11-16 (1949) *July*.

Some helpful suggestions for cementing casing are given.

J. D. Parent

Reserves

Elfrink, E.B., Sandberg, C.R. and Pollard, T.A. APPLICATION OF COMPRESSIBILITY FACTORS IN THE ESTIMATION OF GAS RESERVES. *Gas* **25**, 87, 90 (1949) *June*.

Errors in reserve estimation by neglect of the effect of a liquid hydrocarbon phase in the reservoir are discussed. In particular, the us-

age of a compressibility factor corresponding to the gas phase composition only is discussed.

J. D. Parent

Storage

FEDERAL POWER COMMISSION HEARS NEW CHICAGO PLAN TO STORE LIQUEFIED GAS. *Pipe Line News* **21**, 5-6 (1949) *July*.

A plan to spend $6,000,000 on facilities for liquefying natural gas, storing it in the liquefied state and regasifying it to meet peak loads has been submitted for Federal Power Commission approval by the Chicago District Pipe Line Company. As planned, the liquefaction capacity of the facilities would be 4,000 Mcf per day, the storage capacity would be 400,000 Mcf, the maximum regasification rate would be 6,000 Mcf per hr.

J. C. Lane

Transmission

Baird, R.C. and Bechtold, I.C. MECHANICAL VIBRATION OF PIPING INDUCED BY GAS-PRESSURE PULSATIONS. *Oil Gas J.* **48**, 292, 294, 296, 297, 300 (1949) *July* 28.

Sources of energy for vibration of pipes and associated structures are briefly outlined. The discussion is confined to the generation and nature of gas pipeline pressure pulsations and the means whereby they can produce mechanical vibration in pipes and associated structures. These pulsations are produced principally by (1) compressor action in pressurizing the system for maintaining flow and (2) acoustical resonance effects of chambers and pipe lengths involved in the flow path. Pulsation energy results in mechanical vibration through conversion of pulsation energy into periodic physical force by interaction of the gas and the pipe. These physical forces have complex wave form with component frequencies which lie close to the resonant frequencies of pipe and/or associated structures. Because of the complex wave form it is difficult to make a vibrational analysis of a proposed piping installation. The means for eliminating or minimizing mechanical vibration are not discussed in this article.

O. T. Bloomer

Dickeman, C.T. THE MICHIGAN-WISCONSIN PIPE LINE. *Gas Age* **104**, 27-30, 66, 68 (1949) *August* 4.

This is a rather complete story of the Michigan-Wisconsin line.

J. D. Parent

Olson, G.R. and Beezley, H.V. PRACTICAL CORROSION CONTROL ON GAS TRANSMISSION LINES. *Corrosion* **5**, 249-253 (1949) *August*.

The use of cathodic protection either above or in combination with pipe coatings has increased considerably in the last 10 to 15 years. The cost of cathodic protection is very difficult to determine accurately since the cost is dependent upon certain intangibles such as good will of customers and damage claims from hazardous operations. As power sources, rectifiers are usually preferred where current requirements are high and electric power readily available; galvanic anodes furnish a dependable and economical source of current when small amounts are required; engine-driven generators require an extensive maintenance; and in most areas wind-driven generators are not dependable.

B. E. Hunt

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Catalysts

Lechthaler, C.H., Payne, J.W. and Valas, P.D. (assigned to Socony Vacuum Oil Company). METHOD FOR CONTACTING GASES AND MOVING PARTICLE FORM SOLIDS. U.S. 2,474,199 (1949) *June* 21.

A process is described for drying materials such as catalyst for hydrocarbon conversion. Drying gases are passed through a column of the material at rates such that from 0.02 to 0.2 pounds of water per minute per cu ft of catalyst are removed from the wet catalyst. The humidity is controlled to remove less than one-fourth of that theoretically possible if the gas became completely saturated.

C. H. Riesz

Corrosion

Villagrana, R. J. and Messick, W. W. THE ECONOMICS OF OIL-WELL CORROSION CONTROL. *Oil Gas J.* 48, 58-61, 92-94 (1949) *July* 21.

Some factors of enviroment, such as the nature of the electrolyte, stray currents, and well fluid acidity may provide a relative measure of oil-well corrosiveness. The evaluation of oil-well corrosion cost data is difficult due to fluctuations of labor and materials costs, but the cost data from two wells is shown to illustrate the savings resulting from corrosion control. The three basic approaches to corrosion control are: (1) development of corrosion resistant materials such as stainless steels, monel metal; (2) changing the corrosive enviroment by emulsification of oil and water phases or neutralization; and (3) prevention of contact between the corrosive media and well metal by film forming inhibitors or mechanical coating. The iron content and production rate of well water combined with data from test coupons will give a qualitative measurement of oil-well corrosiveness.

B. E. Hunt

Zeh, H.P. CORROSION PROTECTION OF OIL-REFINING EQUIPMENT. *Oil Gas J.* 48, 99-100, 103 (1949) *August* 11.

One of the most important records of a corrosion engineer is a condensed record of all past corrosion experience available. Corrosion rates of not only the materials of construction used but also of suitable replacement materials should be obtained. In cases where new processes are being considered, the materials of construction could be tested on a pilot plant scale with appreciable savings. Corrosion allowances on equipment should be no more than economical in view of the life of the equipment.

B. E. Hunt

Cracking

Caesar, C.H. CATALYTIC EFFECTS IN SUSPENSOID CRACKING. *Petroleum Engr.* 21C, 22-24, 26, 29 (1949) *July.*

In the Suspensoid catalytic cracking process, from 2 to 30 pounds of powdered catalyst are injected per bbl of oil before passage to a cracking coil of the conventional pyrolytic type. Silica-alumina catalyst has been found to produce cracked gasolines of higher octane number than bauxite. The dry gas yield increases about 1.3% for each 10°F temperature increase. Pressures are held above 200 psig to decrease erosion of return bend headers. The coke deposited on the catalyst is independent of the temperature but increases with increased operating pressure.

C. H. Riesz

Conn, A.L. and Brackin, C.W. CRACKING OF HIGH SULFUR STOCKS: USE OF STEAM WITH NATURAL CATALYST. *Ind. Eng. Chem.* 41, 1717- 1722 (1949) *August.*

For the fluidized catalytic cracking of high sulfur oils, poisoning of natural catalyst can be retarded by the addition of steam prior to contact with oil. A "hydration" of the catalyst is effected which decreases the rate of sorption of sulfur compounds. By the use of large quantities of stripping steam, poisoned catalyst can be regenerated. Tests were carried out in a 2 bbl per day fluid pilot plant and in a full-scale plant.

C. H. Riesz

Helmers, C.J. (assigned to Phillips Petroleum Co.) CATALYTIC OIL CRACKING WITH AIR. U.S. 2,476,729 (1949) *July* 19.

A process for vaporizing a hydrocarbon oil containing a minor portion of coke-forming constituents is described. The oil is preheated but not above coking temperatures. At this point, an oxygen-containing gas (e.g., air) is admixed, the resulting mixture is contacted with an inert, non-catalytic bed of heat-resistant material, and combustion is produced sufficient to complete vaporization. The mixture is then contacted with a contiguous bed of cracking catalyst under cracking conditions.

C. H. Riesz

Fischer-Tropsch Synthesis

Eliot, T.Q., Goddin, C.S., Jr. and Pace, B.S. CHEMICALS FROM HYDROCARBON SYNTHESIS. *Chem. Eng. Progress* 45, 532-536 (1949) *August.*

The amount and distribution of chemicals from a representative hydrocarbon synthesis plant are discussed as are the problems of separation and marketing.

C. H. Riesz

Pichler, H. and Merkel, H. CHEMICAL AND THERMOMAGNETIC STUDIES ON IRON CATALYSTS FOR SYNTHESIS OF HYDROCARBONS. U.S. Bureau of Mines Technical Paper 718. (1949)

An extensive experimental investigation has been made of the changes occurring in the structure of iron catalysts during induction and synthesis in the Fischer-Tropsch process. Thermomagnetic studies revealed the presence of two ferromagnetic iron carbides. A carbide with a Curie point of 716°F is unstable above 572°F and decomposes into a more stable carbide with a Curie point of 509°F. The 509°F Curie-point carbide is formed by carburization at 617°F and is virtually the only one present during medium pressure synthesis. The 716°F carbide is stabilized by the addition of copper to iron catalysts and provides an active catalyst usable at atmospheric pressure. It appears that higher iron carbides do not in themselves act as synthesis intermediates but are important in the structure of iron catalysts. The report is preceded by a foreword by L.J.E. Hofer concerning the physical and chemical properties of iron carbides.

C. H. Riesz

Segura, M.A. (assigned to Standard Oil Development Co.) CATALYST FOR REDUCTION OF OXIDES OF CARBON WITH HYDROGEN. U.S. 2,476,920 (1949) *July* 19.

Catalyst for the synthesis of liquid hydrocarbons from carbon monoxide and hydrogen is prepared by roasting in air an iron pyrites ore (e.g., at 1800-2200°F). The catalyst is ground to suitable size, 0.5 to 10% of an alkali metal compound (e.g. sodium or potassium carbonate) is added and the composite is reduced with hydrogen at a temperature of from 550 to 1100°F.

C. H. Riesz

White, P.C. (assigned to Standard Oil Co.) METHOD FOR THE RECOVERY OF HYDROCARBON SYNTHESIS PRODUCTS U.S. 2,476,788 (1949) *July* 19.

In the recovery of oxygenated compounds produced in Fischer-Tropsch synthesis, the hot vaporous reaction products are cooled to an elevated temperature within the range of about 20 to 100°F below the boiling point of water at the partial pressure of water existing in the vaporous reaction mixture. By this means, the major part of the water can be withdrawn as an aqueous phase containing only a minor portion of the oxygenated compounds. These are recovered in a subsequent cooling step.

C. H. Riesz

Petroleum Production

Arnold, E.C. OIL RESERVES AND SECONDARY RECOVERY: USE OF GASOLINE SUGGESTED IN REPRESSURING. *Oil Gas J.* 48, 286-288, 290 (1949) *July* 28.

Secondary recovery by dry gas or water is considered uneconomical. Reinjection of untreated casinghead gas is suggested with the idea that the gasoline will decrease the viscosity and increase the volatility of the oil while the remainder of the gas should be useful for propulsion.

The final production step would be sweeping the wet gas from the reservoir by dry gas.

J. D. Parent

The following article, the abstract for which appears on the page indicated, is also called to your attention:

Ross, S. D. and Cabot, H. INSTRUMENTATION OF FEDERAL BUREAU OF MINES COAL HYDROGENATION PROCESS AT LOUISIANA (MISSOURI) PLANT. p. 227

7. ANALYTICAL METHODS AND TESTS

Absorber Oil

Brubaker, J.V. METHOD OF ANALYSIS OF ABSORBER OILS FOR CALCULATING STRIPPING AND ABSORPTION EFFICIENCIES. *Oil Gas J.* 48, 90, 92 (1949) *July* 21.

Apparatus and procedure for the laboratory analysis of the absorption oil employed in gasoline plants are given. The method comprises stripping the absorption oil of light hydrocarbons through the pentanes in a specially designed still used in conjunction with a conventional low-temperature fractionating column. The special still permits the use of a sample of absorption oil sufficiently large to provide measurable quantities of pentane and lighter gases for distillation in the low-temperature fractional distillation column, and also provides sufficient depentanized bottoms for checking reclaimer efficiency by means of a standard A.S.T.M. distillation.

H. Hakewill

Carbon and Hydrogen

Fischer, F.O. MICRODETERMINATION OF CARBON AND HYDROGEN. *Anal. Chem.* 21, 827-830 (1949) *July.*

Modifications of Pregl's micromethod for the determination of carbon and hydrogen are described. The construction of automatic combustion apparatus and newly developed absorption tubes, and a method of packing the combustion tube reagents in a more effective manner are given in detail. It is claimed that the use of automatic or semiautomatic combustion with 10 to 20 mg samples will yield carbon and hydrogen values within $\pm 0.02\%$. It was found that results obtained by the automatic microprocedure were generally more accurate than manual microdeterminations. Analytical data for several organic compounds are shown to demonstrate the precision and accuracy achieved with the automatically controlled apparatus.

H. Hakewill

Gas Absorption

Orchin, M. and Wender, I. APPARATUS FOR MEASURINIG GAS ABSORPTION OR EVOLUTION DURING ORGANIC REACTIONS. *Anal. Chem.* 21, 875-876 (1949) *July.*

Apparatus for use in the Zerewitinoff determination of active hydrogen and for quantitative measurement of catalytic hydrogenation and dehydrogenation is described. The apparatus is suitable for analytical purposes and for the preparation of small quantities of desired products.

H. Hakewill

THE ANALYSIS OF GASES BY ABSORPTION. *J. Inst. Petroleum* (British) 35, 353-362 (1949) *May.*

A group working with the British Standardization Committee prepared this general account of absorption methods to make available an outline of a suitable apparatus, a list of typical reagents, and some observations on the more important points of technique required in gas analysis. The apparatus described is of the constant pressure "Orsat" type with modification to permit the use of mercury as the confining liquid, if desired, and to include combustion units for the determination of hydrogen and paraffin hydrocarbons. Sampling, absorption and combustion procedures, and sources of error are discussed. It is anticipated that this outline will serve as a guide for gas analysts and assist in the establishment of a standardized procedure for gas analysis.

H. Hakewill

Gas Analysis

Keilholtz, G. W. and Bergin, M.J. MICRO ANALYSIS OF GASES EVOLVED FROM METAL. *Instruments* 22, 320-321 (1949) *April.*

A micro gas analysis unit capable of analyzing 0.01cc to 2.0cc volumes of gas with an accuracy of 1% of the total sample is described. Sample preparations, analytical procedure, and results are discussed for the analysis of gases evolved from several metals commonly used in electron tubes.

D. V. Kniebes

Miller, R.D. and Russell, M.B. PNEUMATIC AUTODETECTOR FOR INFRARED GAS ANALYSIS. *Anal. Chem.* 21, 773-777 (1949) *July.*

A continuous infrared gas analyzer employing a single beam optical system is described. The absorbed radiation is detected by the thermal expansion of the absorbing gas. It is claimed that variations in CO_2 concentration of 10 ppm may be detected.

S. Katz

Isobutylene

Parker, E.D. and Goldblatt, L.A. METHOD FOR IDENTIFYING ISOBUTYLENE. *Anal. Chem.* 21, 807-808 (1949) *July.*

A method for the identification of isobutylene (2-methylpropene) is based on the catalyzed absorption of isobutylene in phenol and the formation of 4-*tert*-butylphenol. This reaction may also be applied to the identification or 2-methyl-1-butene and 2-methyl-2-butene by formation of 4-*tert*-pentylphenol.

Authors' abstract

Moisture

Johnson, A.S. METHODS USED IN AN INDUSTRIAL LABORATORY FOR THE ESTIMATION OF WATER. *Chem. & Ind.* (British) 1949, 511-514 (*July* 16).

The author reviews the seven methods employed for the determination of water in the laboratories of Bakelite Ltd. The merits and applications of ordinary oven drying, drying with a stream of heated air in the Brabender Moisture Tester, drying in a vacuum desiccator, the Karl Fischer method, the Dean and Starke distillation method, freezing point method for phenols, and semi-quantitative methods dependent upon miscibility relationships are discussed. It is stated that the Karl Fischer method seems to have an almost unlimited scope, and has already been applied to a wide range of products.

H. Hakewill

Nitrogen

Noyce, W.K. MODIFIED DUMAS NITROGEN APPARATUS. *Anal. Chem.* 21, 877-879 (1949) *July.*

The apparatus is an inexpensive modification of conventional macro-apparatus, based upon H.L. Fisher's procedure. A trap-protected Kipp generator provides CO_2 to flush the combustion tube from either end. A "loading tube", coextensive with the combustion tube, is used during charging to protect the CuO spiral, while the system is flushed with a back-flow of CO_2. After loading and replacing the spiral, the CO_2 flow is reversed and heating is carefully increased. Time required is reduced to approximately one-half.

O. P. Brysch

Ultraviolet Analyzer

Kivenson, G., Osmar, J. J. and Jones, E. W. DESIGN OF AN ULTRAVIOLET ANALYZER. *Anal. Chem.* 21, 769-773 (1949) *July.*

The construction and operation of a double beam, continous recording ultraviolet analyzer is described. Interrupted radiation and a tuned amplifier are used resulting in little drift and noise, and good overall stability. Application to the analysis of butadiene-styrene streams is discussed in detail.

D. V. Kniebes

8. GENERAL AND PHYSICAL CHEMISTRY

Adsorption

Harris, B.L. and Emmett, P.H. ADSORPTION STUDIES. *J. Phys. & Colloid Chem.* 53, 811-825 (1949) *June.*

Adsorption measurements were made on pyrex spheres, ground pyrex, porous glass, reduced iron synthetic ammonia catalysts and reduced silver. Nitrogen adsorption was used to measure the surface areas of the adsorbents and the adsorption of a number of substances was studied on each surface, the resulting isotherm being interpreted by both the Brunauer-Emmett-Teller and the Harkins-Jura equations. In both these methods the surface "constants" were found to vary with the adsorbate. A procedure for studying the adsorption of substances of moderate vapor pressure is described.

S. Katz

Catalysts

Hill, F.N. and Selwood, P.W. STRUCTURES AND ACTIVITY OF SUPPORTED NICKEL CATALYSTS. *J. Am. Chem. Soc.* 71, 2522-2529 (1949) *July.*

Magnetic susceptibility isotherms have been determined for nickel oxide supported on magnesia, alumina and titanium dioxide (rutile). The magnetic moment for nickel in the nickel oxide-alumina system changed rapidly with changing nickel concentration, indicating that a substantial fraction of the nickel is in a higher oxidation state than two. The results are explained on the basis that alumina exerts an inductive action on the nickel leading it to assume a radius and oxidation state such that it fits as a simple extension of the alumina lattice. The catalytic activity for the hydrogenation of benzene changed sharply with nickel concentration, those catalysts containing less than 3% being only slightly active while those containing over 10% were highly active. In agreement with current theories, a minimum geometrical aggregation of nickel atoms is required for catalysis of the benzene hydrogenation.

C. H. Riesz

Ridge, D. and Emblem, H.G. A NEW METHOD FOR THE PREPARATION OF CONTACT CATALYSTS. *Chem. & Ind.* (British) 1949, 500 (*July* 9.)

Contact catalysts were prepared by incorporating a suitable catalytic substance with a ceramic carrier bonded by ethyl silicate. Thus, vanadic oxide was mixed with sillimanite into a slurry with ethyl alcohol, ethyl silicate and piperidine. The slurry was slip-cast, air-dried and fired to form a catalyst suitable for the oxidation of sulfur dioxide with oxygen.

C. H. Riesz

Corrosion

Eilerts, C. K. IDENTIFICATION OF CORROSION PRODUCTS USING MEASUREMENTS OF FILM THICKNESS AND MASS. *Ind. Eng. Chem.* 41, 1716-1717 (1949) *August.*

The data of Hackerman and Schmidt [*Ind. Eng. Chem.* 41, 1712 (1949)] is used in an attempt to identify the corrosion product films by the film density as determined by weighings and microscopic examination.

B. E. Hunt

Hoar, T.P. THE BREAKDOWN AND REPAIR OF OXIDE FILMS ON IRON. *Trans. Faraday Soc.* (British) 45, 683-693 (1949) *July.*

The mechanism of breakdown and repair of oxide films on metals, particularly iron, is examined with special reference to the film rupturing anions, chloride and perchlorate, and film repairing anions, carbonate, nitrate, and chromate. Evidence is presented which indicates that film breakdown is preceded by partial repair of the film prior to a complete breakdown. This is believed to be caused by the action of a cell between the oxygen on the film surface and the metal at the base of the pore which produces a precipitated hydroxide or oxide but lowers the pH leading to undermining and film breakdown. The nature and production of pores is discussed and the analogy between oxide-films and paint films is discussed.

B. E. Hunt

Heat of Vaporization

Dreisbach, R.R. CORRECTION FACTOR FOR LATENT HEAT: METHOD FOR OBTAINING HAGGENMACHER CORRECTION FACTOR WITHOUT USE OF CRITICAL VALUES. *Ind. Eng. Chem.* **41**, 1749-1750 (1949) *August.*

The Haggenmacher formulae for the accurate determination of heat vaporization, external work and volume change in vaporization are dependent on accurate critical data. The present paper describes a method of avoiding this limitation by the use of three auxiliary equations which give liquid and vapor densities and the rate of temperature change with pressure from rather more generally available data. A table of comparisons of latent heats for several hydrocarbons and substituted hydrocarbons over a range of temperatures is included.

S. Katz

Hydrocarbon Oxidation

Mulcahy, M. F. R. THE OXIDATION OF HYDROCARBONS. OBSERVATIONS ON THE HIGH-TEMPERATURE REACTION. *Trans. Faraday Soc.* (British) **45**, 537-541 (1949) *June.*

The oxidation mechanisms of a number of molecules containing three carbon atoms show marked differences in the region below 300°C and above 400°C. Rates for the various substances vary widely at the lower temperatures, but are very similar in the upper range. It is suggested that the low temperature reactions occur through peroxide intermediates and that the structure of these intermediates influences the rate profoundly. At high temperatures, the commoner radicals are the intermediates, and the bonds undergoing initial rupture are less selective.

S. Katz

Mulcahy, M. F.R. THE OXIDATION OF HYDROCARBONS. SOME OBSERVATIONS ON THE INDUCTION PERIOD. *Trans. Faraday Soc.* (British) **45**, 575-584 (1949) *June.*

In the low temperature oxidation of n-butane, propylene and isobutane, the reciprocal of the induction period is related linearly to the product of the hydrocarbon and oxygen concentration. No simple generalization is available for the more complicated effect of the reactants on the maximum reaction rate. The induction period is probably related to the period of accumulation of chain initiators, while the maximum rate is a function of chain branching. The effects of temperature and the probable presence of a surface reaction are also considered.

S. Katz

Hydrogen Exchange Reactions

Beeck, O., Otvos, J. W., Stevenson, D. P. and Wagner, C. D. HYDROGEN EXCHANGE REACTIONS OF THE BUTANES IN SULFURIC ACID. *J. Chem. Phys.* **17**, 418-419 (1949) *April.*

By the use of isotopic tracers, it has been determined that the specific exchange rate of the primary hydrogens of isobutanes with catalyst (sulfuric acid) hydrogen and the rate of tertiary-tertiary hydrogen exchange between isobutane molecules are equal over a range of acid concentrations. Tertiary hydrogen in isobutane does not exchange readily with catalyst hydrogen. Neither the primary nor the secondary hydrogen of normal butane undergo measurable exchange. It is suggested that the rate determining factor is the formation of a complex between isobutane and acid catalyst. The rate of tertiary-tertiary hydrogen exchange has been correlated with acid strength.

C. H. Riesz

Wagner, C. D., Beeck, O., Otvos, J. W. and Stevenson, D. P. HYDROGEN EXCHANGE REACTIONS OF PARAFFINS IN THE PRESENCE OF ALUMINUM CHLORIDE-ALUMINA CATALYST. *J. Chem. Phys.* **17**, 419-420 (1949) *April.*

No detectable exchange of hydrogen between ethane, propane, normal butane, isobutane and aluminum chloride-alumina catalyst was observed. Extremely rapid intermolecular exchanges of secondary hydrogens in propane and in normal butane and of tertiary hydrogen in isobutane were found. A slow intermolecular exchange of primary and secondary hydrogens

in propane and in normal butane as well as a slow intermolecular exchange between primary and tertiary hydrogen in isobutane was established. Although the activity of the catalyst for isomerization of normal butane to isobutane decreased by a factor of ten during the work, there was no corresponding change in the rate of intermolecular exchange reactions. Thus different degrees of activation of the adsorbed paraffin are required for isomerization and for intermolecular exchange of hydrogens. It is concluded that preliminary transfer of hydrogen to the catalyst is not a necessary prerequisite for isomerization; it is possible that a liquid phase system is necessary for hydrogen exchange with the catalyst.

C. H. Riesz

Porosities

Bond, R. L. and Maggs, F.A.P. PARTICLE SIZE AND PORE STRUCTURE OF FINELY GROUND CHARS. *Fuel* (British) **28**, 172-175 (1949) *August.*

By assuming heat of wetting of a char surface to be simply dependent on the effective surface, regardless of the wetting agent, it becomes possible to estimate the range of porosities by the use of wetting agents having a range of molecular sizes. Porosities are reduced by heating, and at extreme temperatures are completely closed. The nature and size range of porosities may also be estimated.

S. Katz

Surface Area

Bond, R. L. and Maggs, F. A. P. A NEW BASIS FOR MEASUREMENT OF SPECIFIC SURFACE OF CARBONACEOUS POWDERS. *Fuel* (British) **28**, 169-171 (1949) *August.*

A rapid, though comparative, method of determining the surface areas of carbonaceous materials is described, employing the measurement of the heat of wetting. Evidence is presented to show that the heat of wetting is substantially the same for a wide range of organic substances. A value of 400 ergs/cm^2 is suggested as the heat of wetting for four non-porous carbons, carbon black, diamond dust, graphite powder and powdered coal which had been heated to 1300°C.

S. Katz

Abstractor's Note: It is of interest to observe that the carbonization of coal appears to have sealed off the internal porosities from the wetting liquids.

Thermal Conductivity

Strickler, H. S. THERMAL CONDUCTIVITY OF GASES AND AGGREGATE MATTER. *J. Chem. Phys.* **17**, 427-428 (1949) *April.*

A new approach to the problem of measurement of thermal conductivity of gases at high temperatures consists in measuring powdered or porous aggregates of varying porosity, and extrapolating to 100% porosity. Tentative values for air, H_2, He and N_2 at 700°C are given.

S. Katz

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Crocker, E. C. and Sjostrom, L. B. ODOR DETECTION AND THRESHOLDS. p. 215

Derfer, J. M., Picket, E. E. and Boord, C. E. INFRARED ABSORPTION SPECTRA OF SOME CYCLOPROPANE AND CYCLOBUTANE HYDROCARBONS. p. 225

Hackerman, E. and Schmidt, H. R. KINETICS OF THE CORROSION PROCESS IN CONDENSATE GAS WELLS. p. 213

Kivenson, G., Osmar, J. J. and Jones, E. W. DESIGN OF AN ULTRAVIOLET ANALYZER. p. 221

Markstein, G. H. CELL STRUCTURE OF PROPANE FLAMES BURNING IN TUBES. p. 207

Mayorcas, R. GAS TEMPERATURE MEASUREMENT ABOVE 1500°C. p. 227

9. ORGANIC CHEMISTRY

Absorption Spectra

Derfer, J. M., Pickett, E. E. and Boord, C. E. INFRARED ABSORPTION SPECTRA OF SOME CYCLOPROPANE AND CYCLOBUTANE HYDROCARBONS. *J. Am. Chem. Soc.* **71**, 2482-2485 (1949) *July.*

The infrared absorption spectra of fourteen cyclopropane hydrocarbons and seven cyclobutane hydrocarbons have been determined and are presented graphically. All the cyclopropanes show a characteristic absorption peak at 9.9 microns, while all the cyclobutanes appear to be characterized by a peak at 11.0 microns.

S. Katz

Methane Chlorination

Wilson, M. J. G. and Howland, A. H. CHLORINATION OF METHANE. *Fuel* (British) **28**, 127-135 (1949) *June.*

The results of Hass, McBee, Neher and Strickland on the chlorination of methane have been confirmed. The deposition of carbon and occurrence of flames were studied. Thermodynamic calculations are presented.

C. H. Riesz

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Beeck, O., Otvos, J. W., Stevenson, D. P. and Wagner, C. D. HYDROGEN EXCHANGE REACTIONS OF THE BUTANES IN SULPHURIC ACID. p. 223

Mulcahy, M. F. R. THE OXIDATION OF HYDROCARBONS. p. 223

Wagner, C. D., Beeck, O., Otvos, J. W. and Stevenson, D. P. HYDROGEN EXCHANGE REACTIONS OF PARAFFINS IN THE PRESENCE OF ALUMINUM CHLORIDE-ALUMINA CATALYST. p. 223

10. CHEMICAL ENGINEERING

Azeotropes

Horsley, L. H. TABLE OF AZEOTROPES AND NONAZEOTROPES. *Anal. Chem.* **21**, 831-873 (1949) *July.*

A table of 2154 binary systems and 118 ternary systems have been tabulated under names, formula, individual boiling point and, where applicable, azeotropic composition and boiling point. A formula index and bibliography are included. Cf *Gas Abstracts* **3**, 171 (1947) *October.*

S. Katz

Film Coefficient

Chu, J. C., Flitcraft, R. K. and Holeman, M. R. FILM COEFFICIENT OF CONDENSING VAPOR. *Ind. Eng. Chem.* **41**, 1789-1794 (1949) *August.*

The film coefficient of condensing vapor, h_0, is shown to be dependent on the rate of heat transfer. The Wilson method assumes that the coefficient is independent of the rate, determination of this value being made by extrapolation of test values of overall coefficients to infinite water velocity. At constant heat transfer, q, h_0 is shown to be constant, and if q is held constant by adjusting the temperature difference, Δt, with water rate, h_0 can be determined by a modification of the Wilson method. Δt is held constant by varying the pressure in the vapor space. The coefficients for three compounds were studied: benzene, toluene, and ethyl acetate. Observed values of h_0 were all lighter than those predicted by the Nusselt equation, ratio of the former to the latter varying from 1.03 to 1.29. This ratio approaches unity as the rate of heat transfer decreases. h_0 was predicted to vary with the $-\frac{1}{3}$ power of q. The data for benzene and ethyl acetate tend to confirm this, but that for toluene gives $+\frac{1}{3}$ power.

C. L. Tsaros

Fluid Flow

Tangren, R. F., Dodge, C. H. and Seifert, H. S. COMPRESSIBILITY EFFECTS IN TWO-PHASE FLOW. *J. Applied Phys.* **20**, 637-645 (1949) *July.*

A gas-water mixture, when expanded through a de Laval nozzle, acts as a compressible fluid. A general expression for the flow process as an idealized mixture is developed. The general thermohydrodynamic relations for flow through a de Laval nozzle are developed. The magnitude of the velocity of an energy pulse or signal through the mixture is determined and is compared with the velocity of flow. Experimental results are compared with those predicted using the equations developed.

Authors' abstract

High Pressure

HIGH PRESSURE. *Chem. Eng.* **56**, 107-114 (1949) *August.*

A general review of the progress in the field of high pressure in the last 19 years is presented. New processes involving the use of high pressure are the OXO process, ethylene hydration, hydrogenation of olefins, catalytic polymerization, and natural gas recycling plants. A discussion is presented of methods of fabrication of vessels, which include forging, welding, multilayer construction, wire winding and tape winding. Sketches are shown of high pressure reactors; separators; closures; relief, check, shut-off, and throttling valves. Recent advances in these items are discussed.

W. J. Merwin

Mass Transfer

Hobson, M. and Thodos, G. MASS TRANSFER IN THE FLOW OF LIQUIDS THROUGH GRANULAR SOLIDS. *Chem. Eng. Progress* 45, 517-524 (1949) *August.*

Mass transfer factors of the Chilton and Colburn j type for gases and liquids are a continuous function of a modified Reynolds number.

J. D. Parent

Vapor-Liquid Equilibria

Calhoun, J. C., Jr. ENGINEERING FUNDAMENTALS: USE OF EQUILIBRIUM CONSTANTS. *Oil Gas J.* **48**, 157 (1949) *August* 18.

The basic concept of the vaporization equilibrium constant and the manner in which it varies with temperature and pressure is explained.

J. D. Parent

Smith, K. A. and Watson, K. M. HIGH PRESSURE VAPOR LIQUID EQUILIBRIA: ACTIVITY COEFFICIENTS FOR IDEAL SYSTEMS. *Chem. Eng. Progress.* **45**, 494-506 (1949) *August.*

The equilibrium vaporization constant or K factor has been set equal to y/x, the ratio at equilibrium of the mol fraction of a component in the vapor and liquid phases. It has been customary in the application of K factors to assume ideal solution in both phases due to the difficulty of evaluating activity coefficients. At low pressure a combination of Dalton's and Raoult's laws are often used, while at higher pressure fugacities are employed. Serious errors have been encountered in the critical region, and the most popular means of attempting correction is to employ the convergence pressure concept of White and Brown (*Ind. Eng. Chem.* 34, 1162, 1942). At this pressure K is unity for all components as it reflects the critical condition, and extrapolation is facilitated. However there is considerable difficulty in evaluating the convergence pressure and the critical properties of a mixture. Gamson and Watson, as well as Dodge, have pointed out that a true thermodynamic equilibrium constant is defined in terms of activities rather than mol fractions and that the true equilibrium constant is related to the vaporization ratio defined above through the liquid and vapor phase activity coefficients. Gamson and Watson split the deviation effect expressed by these coefficients into two parts, that due to chemical dissimilarity of the components and that due to difference in molecular size and volatility, and attempted to establish useful correlations. These proved to be difficult to use, and the present authors have refined this work. Several charts are presented to facilitate calculations.

J. D. Parent

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Automatic Control

Oppelt, W. FUNDAMENTALS OF AUTOMATIC CONTROL. *Engr's Digest* **10**, 237-241 (1949) *July.*

This is a continuation of a previous article which abstracts a book on the theoretical aspects of automatic control. In this article, the mathematical treatment of the following topics is presented: series and parallel connection of controller elements; graphical determination of the controller system; subdivision into controller and controlled networks; open-loop systems; closed loop systems; reference-datum control elements; and load disturbance.

W. J. Merwin

Coal Hydrogenation Plant

Ross, S. D. and Cabot, H. INSTRUMENTATION OF FEDERAL BUREAU OF MINES COAL HYDROGENATION PROCESS AT LOUISIANA (MISSOURI) DEMONSTRATION PLANT. *Instruments* **22**, 572-578 (1949) *July.*

The instrumentation for the coal hydrogenation section of the Bureau of Mines demonstration plant is described in detail. Pictures and flow diagrams are presented. Temperatures are measured and controlled by Brown ElectroniK instruments. Pressure recorders, controllers, and recorder-controllers all utilize the Bourdon-tube primary element. Flow rates are generally measured by the differential pressure across an orifice, but vane type flow meters, area meters, and Statham elements are also used. Levels are measured by displacement type floats, "Bin-Dicator" type and diaphragm type instruments. In addition, there is a Bailey hydrogen content recorder, and a Ranarex for specific gravity determination. In one case a "Gagetron" is used for liquid level control.

W. J. Merwin

Heat Exchangers

Katz, L. and Williams, R. B. DESIGN OF FINNED TUBE EXCHANGERS AND CONDENSERS. *Oil Gas J.* **48**, 245-246, 250, 254, 258, 335 (1949) *July* 28.

The authors present methods of computing condensing coefficients on small diameter finned tubes and present graphs of condensing coefficients vs temperature difference for a number of substances. Design methods are illustrated by examples.

W. J. Merwin

Temperature Measurement

Forrest, J. S. THE USE OF SEMI-CONDUCTING CERAMIC GLAZE FOR THE MEASUREMENT OF TEMPERATURE. *J. Sci. Instruments.* **26**, 254-255 (1949) *July.*

The use of semi-conducting ceramic glazes applied to porcelain is proposed for temperature measurement over a moderate temperature range. Operation is based on the large negative temperature coefficient of electrical resistivity usually possessed by these materials.

S. Katz

Mayorcas, R. GAS TEMPERATURE MEASUREMENT ABOVE 1,500°C. *J. Inst. Fuel* (British) **22**, 251-255 (1949) *June.*

In this discussion of high gas temperature measurements, the disappearing filament pyrometer and the sodium line reversal method are reviewed briefly, and the suction pyrometer (high velocity thermocouple) is considered. The sensible heat meter, which measures the temperature increase in a water-cooled calorimeter through which the hot gases are flowing may be used to measure temperatures above 1500°C with an error of less than 2 %.

S. Katz

Vacuum Pumps

Kohl, W. H. PERFORMANCE DATA FOR HIGH VACUUM PUMPS. *Iron Age* **164**, 59-63 (1949) *July* 28.

This paper presents a very compact set of tables listing the operating characteristics of the majority of the domestic diffusion and mechanical

vacuum pumps. Supplementary tables describe the characteristics of vacuum pump oils, greases and waxes.

S. Katz

12. MATERIALS OF CONSTRUCTION

Corrosion

Mc Donald, H. J. and Marsh, G. A. THE PULSE POLARIZER IN CORROSION TECHNOLOGY. *Corrosion* 5, 254-260 (1949) *August.*

The pulse polarizer is capable of replacing the conventional weight-loss or hydrogen evolution tests under certain conditions. Some of the qualitative applications of this instrument are (1) study of inhibitors, (2) alloy identification, and (3) the choice of inhibitors for stress corrosion. Data from this instrument has been used to predict actual quantitative corrosion rates.

B. E. Hunt

Reid, D. K. and Horst, R. L. CORROSION CONTROL BY LIGHT METAL ANODES. PART II. *Southern Power & Ind.* 67, 62-65 (1949) *August.*

The authors discuss the function of galvanic anodes and factors such as chemical backfills, soil resistivities, and electrical circuits which affect their performance. The principal functions of chemical backfills are: (1) provide a local low resistivity, anodic environment; (2) minimize anodic polarization and high resistance anodic film formation; (3) favorably influence anodic potential; and (4) reduce anodic corrosion. Several criteria of protection which are in common usage, and which are substantiated by favorable service records are mentioned.

B. E. Hunt

Wyllie, D. and Cheesman, G. C.N. SODIUM NITRITE AS AN INHIBITOR AGAINST THE ATTACK OF SEA WATER ON STEEL. PART I. THE INFLUENCE OF SODIUM NITRITE ON THE AREA AND INTENSITY OF ATTACK. *J. Soc. Chem. Ind.* (British) 68, 165-168 (1949) *June.*

In the presence of sufficient sodium nitrite to reduce the attack to small intensity in sea water, a semi-protective oxide film is formed on mild steel and normal pitting ultimately appears. The addition of phosphates increases the protection afforded even under conditions where neither nitrites nor phosphates would be effective.

B. E. Hunt

Refractories

REPORT OF THE DIRECTOR FOR THE YEAR 1948. PART IV. REFRACTORIES. *Gas Research Board* GRB 45, 26-29 (1949) *April.*

A summary of the work of the Gas Research Board during the past year discusses properties of refractory bricks and insulating materials. The former includes a study of the shrinkage of brick on reheating, the determination of the quartz content in siliceous refractories by measuring the heat of the quartz inversion temperature at 574°C, the cause of flaking in vertical retort walls, the slagging effects of iron-calcium oxides on alumino-silicate refractories and the behavior of refractories under thermal stress. Determinations of heat transfer in refractory insulating materials are reported.

S. Katz

Abstractor's Note: The value of the thermal conductivity data is considerably reduced by the ambiguous assignment of dimensions.

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Eilerts, C. K. IDENTIFICATION OF CORROSION PRODUCTS USING MEASUREMENT OF FILM THICKNESS AND MASS. p. 222

Hackerman, N. and Schmidt, H. R. KINETICS OF THE CORROSION PROCESS IN CONDENSATE GAS WELLS, p. 213

Olson, G. R. and Beezley, H. V. PRACTICAL CORROSION CONTROL ON GAS TRANSMISSION LINES. p. 217

Villagrana, R. J. and Messick, M. W. THE ECONOMICS OF OIL-WELL CORROSION CONTROL. p. 218

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